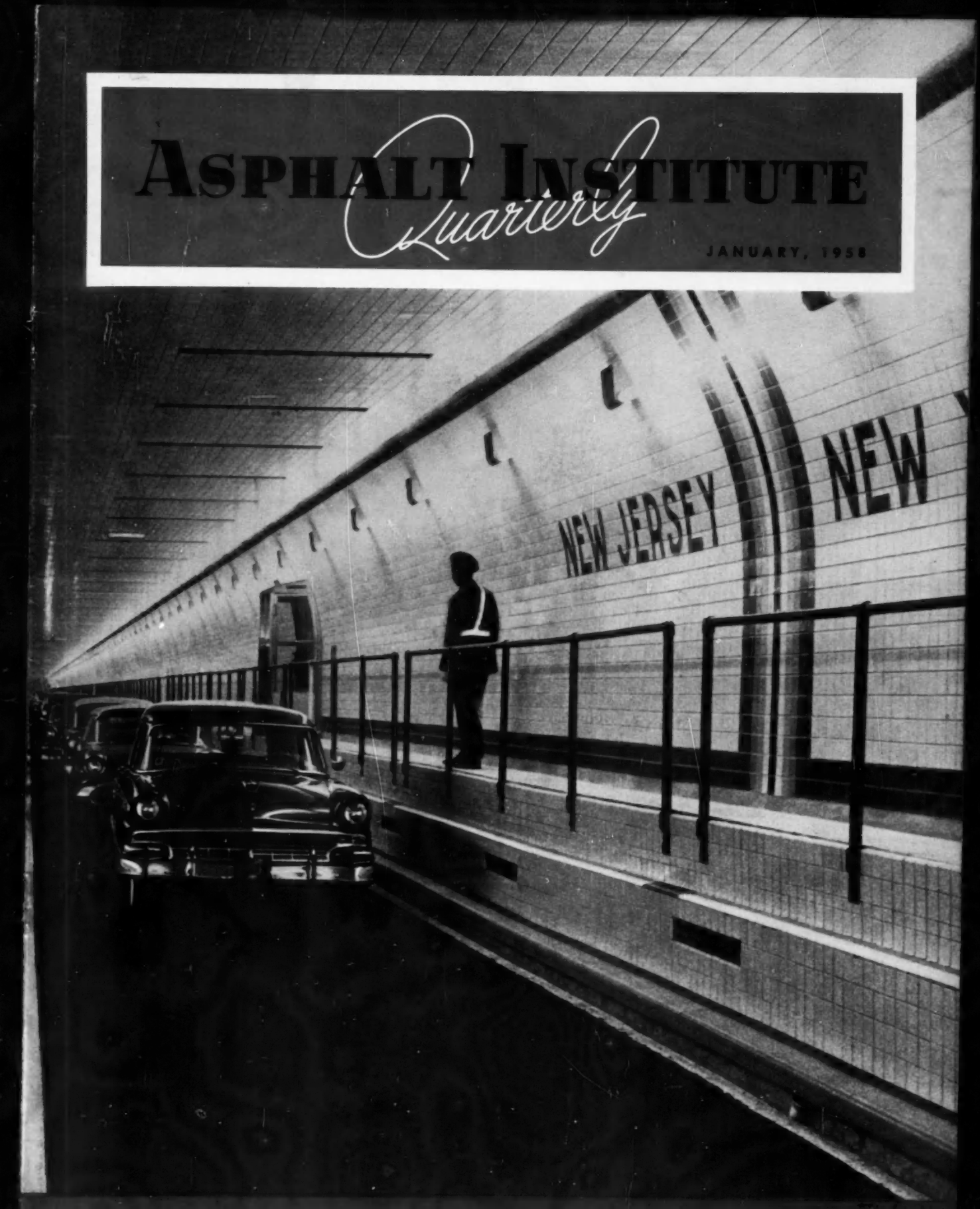
Asphalt Institute Quarterly

JANUARY, 1958



ASPHALT INSTITUTE MOTION PICTURES

All Produced in 16mm, Color and Sound

FROM BYWAY TO SUPERHIGHWAY Newest in a series of Asphalt Institute productions. It's a colorful, fast-moving story about the evolution of the modern asphalt road, prepared in a manner that will hold the interest of engineer and motorist alike. Running time: 16 minutes.

ASPHALT THROUGH THE AGES A documentary that traces history of asphalt from ancient times to the present. Depicts the many modern uses of this miracle construction material, with special emphasis on road paving. Methods of refining asphalt from crude petroleum are simply explained. Length: 486 feet. Running time: 13½ minutes.

TWO ROADS The fascinating story of how two roads, one paved with asphalt, the other with concrete, were built and how they are serving the motoring public. Prepared especially for television showing and for presentation to businessmen's clubs, non-engineering groups and the general public. Length: 502 feet. Running time: 14 minutes.

ASPHALT—THE MAGIC CARPET Tells non-technical story of advantages of asphalt pavement construction through medium of actual present-day American Town Meeting on Long Island. Laboratory demonstrations of asphalt's physical properties. An introduction to asphalt for the general public. Length: 940 feet. Running time: 26 minutes.

SEAL COATS Methods and procedures for applying asphalt seal coats and light surface treatments. Length: 590 feet. Running time: 16½ minutes.

THE GARDEN STATE (NEW JERSEY) PARKWAY Story of asphalt construction on this beautiful 165-mile parkway that serves New Jersey's popular shoreline resorts. Length: 516 feet. Running time: 14½ minutes.

THE NEW JERSEY TURNPIKE Construction of this famed superhighway from foundation to finished asphalt pavement. Length: 726 feet. Running time: 20 minutes. Tag ending describing the widening to six lanes of 61 miles of the Turnpike is also available. Length: 146 feet. Running time: 4 minutes.

THE TURNER (OKLAHOMA) TURNPIKE Procedures employed in constructing Oklahoma's 88-mile, heavy-duty asphalt toll highway. Length: 875 feet. Running time: 25 minutes.

HEAVY-DUTY HIGHWAYS WITH HOT-MIX ASPHALT Heavy-duty asphalt highway construction in the U.S. Shows how materials are obtained and assembled, with complete asphalt plant operation. Length: 865 feet. Running time: 24 minutes.

ASPHALT IN HYDRAULICS How asphalt is used to pave and protect such hydraulic installations as dams and dikes, canals, reservoirs, jetties, groins. Shows equipment and construction methods employed. Newly revised. Length: 800 feet. Running time: 22 minutes.

These Asphalt Institute films are available on a loan basis or they may be purchased. Inquire at your nearest Asphalt Institute office (see list on page 15) for full information.

Channelized Traffic

THE cover story in this issue of the QUARTERLY is a report on the recognized superiority of asphalt paving for the nation's busiest vehicular tunnels. Here, in these heavily traveled tubes, a pavement is subjected to the toughest test of all—"channelized" traffic.

Channelized traffic is a pattern of travel by wheeled vehicles in which the wheels tend to follow a narrowly defined track. As a rule, this is dictated by special circumstances. For example, it's a pattern of traffic commonly associated with the movement of heavy military bombers. Because of limited visual range and in order to accommodate the huge wingspan to relatively narrow taxiways, the pilots of these big aircraft follow a centerline stripe on the pavement as they move the giant planes to and from the flight runway. This, in turn, establishes a pattern of channelized traffic.

TUNNEL TRAFFIC CHANNELIZED

Similarly, in our busy vehicular tunnels, traffic is necessarily funneled into a similar pattern. This means that, hour after hour and day after day, heavily laden trucks and streams of automobiles are almost literally following a track from portal to portal. There can be no substantial lateral distribution of traffic, as happens on open highways or city streets.

As the lead article in this issue of the QUARTERLY tells us, flexible asphalt paving has performed excellently under the relentless channelized hammering of heavy trucks in the Holland tube for eight years. In that time, and under the pounding of an estimated 50 million heavy trucks and buses in addition to normal automobile traffic, the pavement has shown no significant sign of fatigue.

Indeed, engineers predict many more years of maintenance-free service before any major repair job will be required.

OVERNIGHT RESURFACING

When that day (or rather, night) comes, the remarkable versatility of asphalt paving will be proved once again. With no interruption of the normal flow of traffic, the travel lanes in that tunnel will be resurfaced with a smooth, new mat of asphaltic concrete in a matter of hours and be ready to take another long-term beating under the toughest conditions that modern vehicular traffic can impose.

Boiled down to its essence, day after day modern asphalt paving is proving the **practical** answer to every road surfacing problem.

ASPHALT PAVES OUR FINEST HIGHWAYS

ASPHALT INSTITUTE Quarterly

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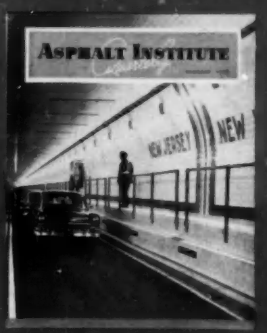

The lead article this issue features modern asphalt paving in three recently opened underwater highway tunnels. To bear the brunt of some of the heavy volume of traffic that moves daily between New York City and New Jersey, a third tube was added to the Lincoln Tunnel, increasing its capacity by 50 percent. Pictured here is a shot of the new Lincoln tube in use. Note the sharply defined lane markings and the modern fluorescent lighting.

The Asphalt Institute Quarterly is published by The Asphalt Institute, an international, nonprofit association sponsored by members of the asphalt industry to serve both users and producers of asphaltic materials through programs of engineering, research and education.

The member companies of the Institute, who have made possible the publication of this magazine, are listed on page 15.

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ASPHALT PAVING PUTS TO SEA

Route of new Baltimore tunnel follows battle line of British fleet that attacked Ft. McHenry.

Paving south ramp of tunnel which cuts 30 minutes off travel time through Baltimore.

BALTIMORE TUNNEL

THERE ARE five cities in the United States larger than Baltimore; but as a traffic bottleneck, Baltimore has always been in a class by itself.

This sprawling metropolis which wraps itself around the estuary of the Patapsco River at the head of Chesapeake Bay lies athwart the major north-south highway routes on the crowded East Coast. Up to last month these routes carried motorists smack through the heart of the congested downtown area. To negotiate the ten terrible miles through the clogged city streets took at least thirty minutes under normal conditions. The unfortunate motorist who caught the rising tide of rush-hour traffic was doomed to an hour or more of grinding, yard-by-yard progress.

FIFTH LONGEST IN WORLD

But all that is just an unpleasant memory. The 7,650-ft. Baltimore Harbor Tunnel, fifth longest in the world (others: Mersey River Tunnel, Liverpool, England, 10,584 feet; Brooklyn-Battery Tunnel, 9,117 feet; Holland Tunnel, 8,557 feet; Lincoln Tunnel, 8,215 feet), now feeds 30,000 cars and trucks through the heart of the city daily and delivers them swiftly onto a broad highway far from the madding throng. For the motorist and truck driver, Baltimore has become just another metropolitan skyline to be admired as he drives onto a velvet-smooth carpet of modern asphalt pavement before swooping into the new tunnel.

Heavy-duty asphalt paving surfaces the floor of the tunnel and its approaches. Original plans called for brick flooring, but the consulting engineers (J. E. Greiner Co., Baltimore) and the design engineers (Singstand and Baillie, New York) recommended modern, heavy-duty asphalt paving. They had sound reasons for making this recommendation. A sturdy, durable mat of asphaltic concrete could be laid swiftly and, in time, swiftly repaired—both critically important factors in tunnel paving. Then, too, the cushioned asphalt pavement would reduce the overpowering traffic roar in the tubes to a muted whisper.

This year an anticipated 12 million vehicles will use the new tunnel, and this figure is expected to increase to 18 million by 1972. This steadily rising torrent of automobiles and heavy interstate freighters has presented a major problem in urban congestion in Baltimore since the 1930's when the possibility of tunneling a harbor by-pass was first advanced seriously.

PAVED IN FIVE WEEKS

In the busy post-World War II years the tunnel project became more than a discussion subject; it became a crying necessity and the only obvious solution to a growing crisis. Finally, in 1953, preliminary work was started and the tunnel reached the paving stage October 9, 1957. Paving was completed five weeks later and the tunnel officially opened to traffic on November 30, in time to accommodate the heavy traffic moving north to the Army-Navy football classic in Philadelphia.

Construction of the twin-tube structure beneath the Patapsco was handled by Merritt-Chapman-Scott Corp., specialists in that field. Like so many of their projects of this type, the tunnel was constructed of prefabricated units, 21 in number. Each measured 70 feet wide by 35 feet high and 300 feet long and was built on special shipways, launched like a ship and towed into position over a submarine trench carved in the sand-gravel bed 100 feet below the surface of the water. There divers joined the units, much like an underwater pipeline; then workmen entered the tubes, knocked out the watertight steel bulkheads, and proceeded with the interior work.

The 4¼-inch pavement was placed over the reinforced concrete floor of the tunnel and its ramps in three layers—levelling course, binder and surface. The first two courses were laid in 10-foot and 11-foot lanes, and the surface course was put down in two 10-foot 6-inch lanes so none of the three joints coincided.

Composition of the paving mixture, designed by the Baltimore Asphalt Block and Tile Company, consisted of crushed trap rock up to ¾-inch in size and washed sand. The asphalt content was 4.75% in the base and binder courses, and 6% in the surface course. To pave the entire project required approximately 10,000 tons of hot-mix asphaltic concrete.

An ingenious arrangement of fans and ducts has been installed in the tunnel to carry off the noxious fumes of the swirling traffic and to change the air in the tubes 38 times an hour. In fact, the tunnel air is fresher than that in many a modern, air-conditioned office building.

LIGHTING SYSTEM UNUSUAL

Another safety feature is the elaborate lighting system, designed to meet both day and night conditions. Each tube has two continuous rows of fluorescent lights suspended just below the ceiling on each side of the roadway. Two zones of light—an intensive zone and a normal zone, provide variations of lighting to permit safer day and night driving. During daylight hours, the intensive light which extends 750 feet in from the entrance portals, affords the eye sufficient time to adapt itself from the high daylight level outside to the lower level inside. With the approach of night, an astronomical time-clock automatically turns off the intensive zone and normal light intensity is maintained throughout the tunnel.

In a few years, a trip through Baltimore's tunnel-expressway will seem like a ride through a public park. Approaches to the tunnel will be planted with 12,172 trees and 112,625 shrubs. More than $600,000 is being spent on landscaping alone—a project designed to make this urban throughway the handsomest highway in Maryland.

While beautification is the primary purpose of this vast landscaping project, there are some very practical considerations also. For one thing, the planting of trees and shrubbery will mask the glare of approaching headlights and help reduce traffic noise. It will assist in slope stabilization and screen unsightly views, extending the rural character of the roadway into the urban tunnel approaches.

SAVES TRAVELER 34 MINUTES

The Maryland State Roads Commission, which administers the $130 million project, estimates the tunnel will lop some 34 minutes off the travel time for motorists and truckmen crossing Baltimore on their north-south journey. A substantial saving in time will be made for travelers swinging through Baltimore from or into the West via U. S. 40. For Baltimore's own pedestrians and intracity traffic, the new tunnel will be a distinct blessing, relieving a heavy burden of congestion which had made the city a traffic officer's nightmare.

Meanwhile, travelers wheeling through the new tunnel can enjoy the added thrill of rubbing elbows, vicariously, with history. The twin-tubes follow the approximate battle line of the British fleet which bombarded Fort McHenry in 1814 while Francis Scott Key paced the deck of a British supply ship and penned his immortal "Star Spangled Banner."

But the hiss and roll which tunnel users will hear won't be the sound of the surging tide against oaken planks of ghostly frigates. It will be the comfortable sound of tires moving smoothly and softly over modern asphalt paving—the most durable and economical carpet for high-speed traffic tunnels.

LINCOLN TUNNEL

SUBAQUEOUS highway-tunnel construction is booming. Within the last year three such thoroughfares have been opened to traffic, bringing the world's total to sixteen. Most recently completed of these engineering marvels was the Baltimore Harbor Tunnel, described in the preceding pages. The others recently completed are Virginia's Hampton Roads Tunnel, opened November 1, and New York-New Jersey's Lincoln Tunnel, the third tube of which was completed and opened last May 25. All three are paved with asphalt.

Some of the world's most heavily concentrated volume of traffic moves across and beneath the Hudson River between New York City and New Jersey. A tally revealed that nearly 78 million vehicles made the crossing in 1956 via the Holland and Lincoln Tunnels and the George Washington Bridge, with about 42,500,000 using the two tunnels. To keep this tremendous mass of traffic moving, the Port of New York Authority found it necessary to add another tube to the Lincoln Tunnel to absorb some of the load, increasing its capacity by some 50%.

SEEING WAS BELIEVING

Port Authority engineers chose modern asphalt paving for the third Lincoln Tunnel tube, basing their selection on the outstanding performance of the hot-mix asphalt flooring in the Holland Tunnel located a few miles to the south. The latter pavement, laid in 1949 after removal of the original granite block pavement, has withstood the tremendous pounding of millions of cars, trucks and buses for the past eight years. It has required no maintenance whatever and is still in excellent condition. The Authority figures it will need no repairs for at least another ten years under capacity traffic.

Another asphalt-paved tube for the Lincoln Tunnel.

In addition to satisfactory performance under the heaviest and most concentrated traffic loads, there were five specific reasons for the selection of heavy-duty asphalt paving for the new Lincoln tube—speed and ease of construction, improved riding quality, high skid resistance, low maintenance cost, and the quietness afforded by the seamless, cushioned pavement. It is probable the engineers also considered the matter of future pavement resurfacing. The entire paving operation took only five working days—or, rather, nights—since all paving work started at 6:00 P.M. and wound up at 6:00 in the morning.

The new tube measures approximately 8,000 feet in length by 22 feet in width. The pavement design called for a 2½-inch binder course and a 2-inch surface course—a total thickness of 4½ inches. Approximately 4,600 tons of asphalt hot-mix were used in the two layers. Aggregate gradations and asphalt content for both courses are shown in the following table:

	Percent Passing (Total)	
Sieve Size	Binder	Surface
1½″	100	—
1″	95-100	100
¾″	—	92-100
½″	57-67	72-82
⅜″	—	60-70
#4	25-35	51-60
#10	19-26	36-44
#40	14-22	28-35
#80	5-12	11-19
#200	1-5	4-8
Asphalt Cement		
85-100	4.0-4.6%	5.2-5.8%

Two paving machines and four rollers were employed throughout the job. The pavers worked in tandem not over 100 feet apart to assure a hot joint. All longitudinal joints between top and bottom courses were staggered by at least 6 inches, with the pavement placed ¼ inch higher than the headers to allow for future compaction as a result of the channelized traffic.

HAMPTON ROADS TUNNEL

IN TIDEWATER VIRGINIA, where the waters of the James River mingle with those of the Chesapeake Bay to flow into the Atlantic, lies a tranquil body of water called Hampton Roads.

Nearly a century ago these quiet waters were roiled by one of the decisive naval battles of history—between the iron-clads Monitor and Merrimac. More recently those waters have been muddied by construction crews building the sixth longest underwater highway in the world. The new Hampton Roads Bridge-Tunnel system also is the most costly project ever undertaken by the Virginia Department of Highways.

COST IS $60 MILLION

Including the approach highways, which will require about two years to complete, the entire $60,000,000 toll facility is 23.6 miles long, providing rapid and convenient travel between the Hampton Roads area and points north and south. It replaces the ferry fleet that for more than 40 years had been transporting traffic across the famed channel.

During the first year's operation an estimated 6400 vehicles daily are expected to take the underwater route between Old Point Comfort and Willoughby Spit. And they will have the smoothest ride a paved surface can offer because four inches of asphaltic concrete covers the entire 7479-foot length of the tunnel.

Approximately 6000 tons of materials were needed to pave the 23-foot-wide two-lane thoroughfare. A run-down of aggregate gradations follows together with asphalt content in each course.

Sieve Size	Percent Passing Binder	Surface
1½"	100	—
1"	—	—
¾"	78	—
½"	—	100
⅜"	49	92
#4	42	62
#10	35	46
#40	16	16
#80	9	9
#200	5	5
Asphalt Cement 60-70	4.5%	6%

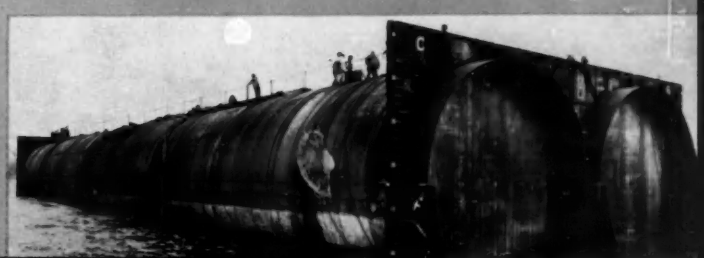
Although storm conditions prevailed during much of the paving operations, work was not delayed. To prevent the covered trucks from dripping water on the roadway inside the tunnel, burlap was placed on the approach ramps to dry the trucks' wheels as they entered.

HURRICANE GATES INSTALLED

Inside the tunnel the most advanced types of ventilation, lighting, and alarm systems have been installed for the safety of motorists. Hurricanes in the Norfolk area in recent years prompted the development of greater protective measures for the unique man-made portal islands. This led to the installation of tide gates at both portals, which can be closed in case of emergency.

William R. Glidden, assistant chief engineer for the Virginia Highway Department was in charge of construction for the Hampton Roads Bridge-Tunnel system. Parson, Brinckerhoff, Hall and Macdonald, consulting engineers, New York, were responsible for the final design and construction of the overall project. The tunneling was handled by Merritt-Chapman and Scott Corporation, New York City and subcontractor for actual paving operations was Ames and Webb, Incorporated, Norfolk.

Man-made portal islands feature Hampton Roads tunnel.



Pre-fab tubes were floated into position and sunk.

Completed: a carpet of asphalt from shore-to-shore.

A Balanced Budget For Roads

Seen By Federal Highway Official

". . . We expect almost as much money to be committed to the primary, secondary and urban roads as to the vital Interstate network."

A BALANCED PROGRAM, weighted equally for the completion of the 41,000-mile Interstate System and the overhaul of the nation's A-B-C roads, was pledged last month by Paul F. Royster, assistant to Federal Highway Administrator Bertram D. Tallamy.

Pinch-hitting for the hospitalized Administrator, Mr. Royster told a luncheon gathering of Asphalt Institute directors and guests in New York:

> ". . . Over the 16-year construction period, we expect almost as much money to be committed to the primary, secondary and urban roads as to the vital Interstate network."

Supporting this thesis, Mr. Royster told the group that, as of November 1, 1957, contracts had been advertised and funds obligated totaling $4.47 billion for the entire road program, of which $2.3 billion were earmarked for the Interstate System.

NO RUNAWAY INFLATION

The speaker assailed "alarmist talk" about the threat of runaway inflation in construction costs because of the size of the program. He observed:

> "To me this indicates a very dubious brand of economic prophesy. Presently, at the beginning of a 15- to 16-year program, it is an entirely gratuitous assumption to say that the costs of materials and labor will continue to rise. Acutally, such an assumption runs counter to the long-term trends of technological development with constantly increasing productivity."

Mr. Royster predicted the continuity and scope of the massive road program would make possible many economies in highway programing and construction.

SERIES OF 5-YEAR PLANS

Citing the need for coordination of effort on all production and construction fronts, the speaker pointed out that a "steady, predictable flow of products over a long period means both better planning, and more efficient production, and, of course, greater economy."

He continued:

> "To help achieve this highly desirable end, the several states and the Bureau of Public Roads have begun a really big job. We intend to have each project that is to be built on the Interstate System during each of the next five years scheduled into our production line, and to have the remaining work grouped into two or three similar schedules of four or five years, but in lesser details than for the first group. Thus the work will be lined out progressively, step by step, year by year, for every single mile of the System.
>
> "What does this mean? It means, first of all, that the States can balance their work load and carry the program forward, putting high priority projects first, to achieve a useable component of the system at the earliest possible time. It means also, that the States can make the best use of their working forces, whatever the stage of development of the project. What does it mean to you suppliers? It means more efficient, better planned production of needed materials—steel, aggregates, bituminous materials—the whole range of necessary components."

Mr. Royster's address highlighted an annual meeting which found officials of The Asphalt Institute again offering highway officials firm assurance that ample supplies of asphalt products will be available to meet construction needs in every phase of the great road program.

ECONOMY AND SPEED EMPHASIZED

The speaker's emphasis on speed, efficiency and economy in pushing the multi-billion dollar road program struck a popular note with an audience concerned by a reported 2.4 percent dip in asphalt tonnage sales during 1957. Many listeners saw in the phased construction program outlined by the Assistant Federal Highway Administrator a firming up of the demand for paving asphalts in 1958.

On one critical aspect of the road program the speaker stood mute. He made no reference to the looming re-estimate of costs by the states, scheduled for airing before the new Congress this month. It is no secret that highway officials, at both the state and Federal levels, are concerned by the soaring cost of the program as the states take a "second look" at their original estimates. The original $25 billion program is now exceeding the first estimates, according to reports, by varying amounts ranging from 25% up to 100%.

Mr. Royster's silence on this significant point while predicting a probable downward trend in unit construction costs as the program gathers speed left many of his listeners wondering. At any rate, it is clear that economy and efficiency will be most important to provide the roads we need in the face of growing demands for money for other phases of defense and stepped-up technological education.

". . . The continuity and scope of the program will make possible many economies . . ."

". . . A steady, predictable flow of products means, of course, greater economy."

THE WILL AND

TO PLAY FAST and loose with an old saw, the turnpike builders in Oklahoma have given a new meaning to the phrase: Where there's a Will there's a way.

As an enduring memorial to their beloved cowboy humorist and philosopher, the late Will Rogers, Oklahomans have added an 88.5-mile northeastern leg to their original asphalt-paved Turner Turnpike, carrying the heavy-duty asphalt theme from Tulsa to the Missouri line near Joplin.

The new turnpike, which will be incorporated in the National System of Interstate and Defense Highways, adds another link to the huge 41,000-mile network of high-speed, super-expressways that will eventually carry the motorist coast-to-coast and border to border without encountering a single stop-light.

MATCHES TURNER TURNPIKE DESIGN

The latest Sooner superhighway roughly parallels U. S. 66 but bypasses all the intermediate cities between Tulsa and the Missouri line. There are interchanges at Claremore (Rogers' home town), Big Cabin, Vinita, Afton and Miami, for those who desire to enter or leave the 70-mile-an-hour expressway.

Of the 88.5 miles of turnpike, all but 11 miles are paved with modern asphaltic concrete, and with a few exceptions is identical in geometric design with its companion toll road, the 86.3-mile Turner Turnpike between Tulsa and Oklahoma City (see October, 1952, issue of the QUARTERLY.)

A typical cross-section of the Rogers Turnpike shows five inches of asphaltic concrete placed over seven inches of stabilized aggregate base. In turn, this is supported by 12 inches of special sub-base material.

The five inches of asphaltic concrete include a three-inch binder course with two inches of dense hot-mix wearing course. Asphalt content ranges from 5 to 7 percent in the surface layer and 4.5 to 6.5 percent in the binder course.

CONSTRUCTION TECHNIQUES

In the never-ending search for better ways to build better pavement, the engineers on the Will Rogers Turnpike made some departures from the construction techniques used on the Turner Turnpike. For instance, the subgrade, subbase and stabilized base course materials in the Rogers Turnpike were compacted by 50-ton pneumatic tire rollers to 100 percent of standard AASHO density. Also, the 12 inches of select subbase materials were placed by the paving contractor, while the same type material was placed by the grading contractor on the Turner Turnpike.

Finishing machines operated in tandem on both courses so that a hot joint could be effected. To increase safety, vertical clearance beneath all structures on the turnpike was increased from 15 feet to 16 feet and the clearance between shoulder edge and the structural piers was increased from six feet to

THE WAY

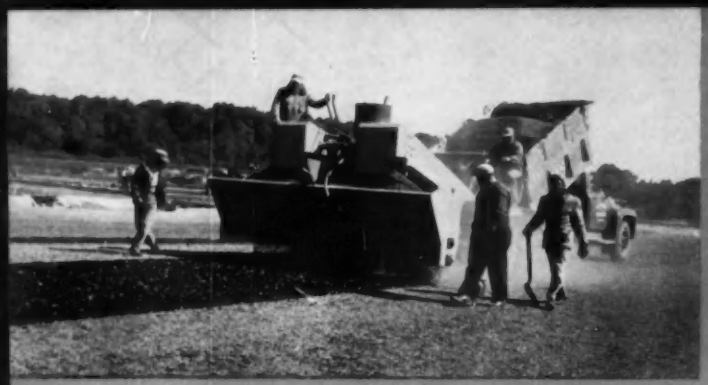
ten feet. The pavement surface is 24 feet wide on each side of the median strip, sloping ⅛ of an inch per foot toward the outside shoulder.

TURNPIKE CAREFULLY SERVICED

Since its opening last June 28, the turnpike Authority's maintenance crews have been especially busy giving special attention to the comfort and convenience of the turnpike travelers. Early each morning, the maintenance trucks are on the road patrolling the entire length of the turnpike, checking existing conditions and removing all debris and small animals that may have been destroyed on the road during the night.

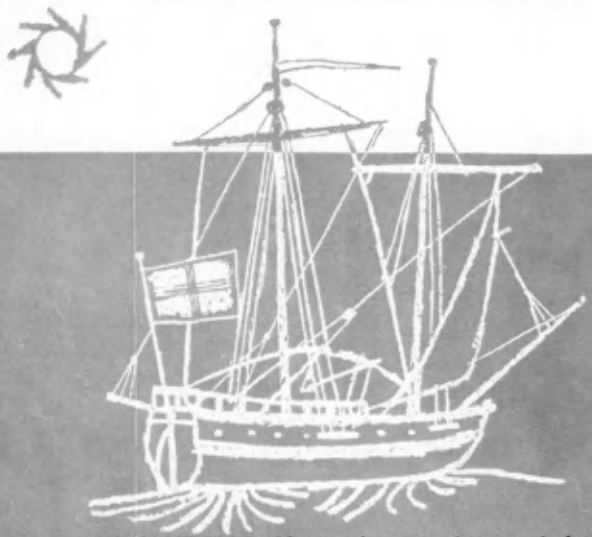
Other special services are offered by these roving crews. Each truck carries emergency cans of water and gasoline for motorists in distress. During the scorching summer months the maintenance trucks also carry ice water for the occupants of stalled or disabled vehicles on the toll road.

Thus, the dynamic state of Oklahoma is steadily reducing its problem of providing adequate highways to transport the rising volume of products and people that must move swiftly and safely over its highways. Both the Turner Turnpike and the Will Rogers Turnpike represent typical examples of how modern asphalt design and construction are furnishing the nation with more and more miles of hard-working, long-lasting superhighways that earn their way—and are earning the increasing respect of highway engineers everywhere.



Rugged base for a rugged pavement: asphalt-penetrated macadam is placed.

For 62 miles on the eastern leg of the new Connecticut pike, modern heavy-duty asphalt carries the pilgrim over rolling countryside.



PILGRIM'S

Oldest Colonial Trade Route—

THE NATION'S oldest trade route this month became the nation's newest toll road as Connecticut opened her 129-mile turnpike from the limits of suburban New York City to the Rhode Island state line. Sixty-nine of those miles eastward from New Haven, are surfaced with modern, heavy-duty asphalt pavement—Connecticut's first extensive use of this type of paving.

Thus, for the third time in our generation Connecticut has met the challenge of traffic congestion on the historic Boston Post Road. Back in the 1920's the first wave of freight trucks shuttling between Boston and New York compelled a widening of the Post Road from two to four lanes. But this offered only temporary relief and in the 1930's the Merritt Parkway was laid out along a roughly parallel route north of the Post Road to drain off the high-speed passenger traffic.

Again relief was temporary. In less than a decade World War II uncorked a flood of truck traffic running between New England's myriad defense plants and the Port of New York. The old Post Road became a worse bottleneck than before and Connecticut began looking for a long-term solution to the problem.

LAST OF THE BIG TURNPIKES

Out of this search grew the vision of the Connecticut Turnpike which, even among turnpikes, is something special. To begin with, it could very well be the last major turnpike built in our time as the great Federal road program begins to take over the burden of dissolving the nation's traffic clots. And it has other unusual features.

For instance, it has the longest stretch of uninterrupted urban expressway in the nation. From the Connecticut line at Greenwich all the way to New Haven—a distance of 49 miles—the Turnpike bulls its way through an unbroken chain of cities and towns. Further, this entire 49-mile section is illuminated, a sensible engineering precaution to help the speeding motorist make his selection among the 49 separate interchanges which serve the communities along this portion of the route.

Principally because of this vast complex of structures—overpasses, bridges, ramps and interchanges—it was decided to pave this urban section of the turnpike with rigid slabs. With concrete bridge decks and structures less than a mile apart it was decided that full pavement with this material would simplify construction operations.

ASPHALT ON EASTERN LEG

However, from Branford, five miles east of New Haven, on to the road's eastern terminus, the design called for asphalt paving. The original plan was to build only the first two lanes of a four-lane divided highway on two long stretches of the road east of the Connecticut River, adding the second "barrel" at a later date. But the 1957 General Assembly ordered construction started immediately on the additional lanes, raising the total estimated cost from $445 million to $464 million. Paving of the second barrel on the eastern leg is scheduled for 1958 after allowing time for settlement in the foundation fills.

Construction of the Turnpike was complicated by all kinds of geological debris left behind in the retreat of the last Ice Age. The state is drained by scores of tidal rivers which meander down to Long Island Sound and the Atlantic. Hurdling these streams (and incidental railroads and highways) required 198 bridges and viaducts. No less than eight high-level spans, with clearances ranging from 40 feet up to 65 feet, cross as many river estuaries between Greenwich and New Haven.

East of New Haven, the road continues to skip over navi-

PROGRESS

Nation's Newest Turnpike

gable rivers and streams along the shore until it swoops northeast at the Thames River and follows the route of the old Mohegan Road from New London to Norwich, second turnpike to be built in this country (1792). Beyond Norwich, it leaps the Quinebaug River and pushes on through typical New England roller-coaster country to a meeting at the Rhode Island line with U. S. 6, principal route west from Cape Cod.

The turnpike dream began to take shape as far back as 1947 when highway officials began acquiring property for the relocation of U. S. Route 1 in the town of Old Saybrook. Some 4,900 title searches later the route of the new turnpike was laid out over 4,688 pieces of acquired property.

PAVING DECISION TOOK COURAGE

The decision to pave the eastern leg of the road with asphalt took political courage. As a group of taxpayers, the people of Connecticut were not psychologically prepared for such a radical departure from tradition. Connecticut has an almost exclusive record of slab construction on its primary roads. In addition, it offers some classic specimens of obsolete tar and "blacktop" roads on the secondary system, hardly likely to generate great popular enthusiasm for asphalt paving on major traffic arteries. The proximity of neighboring Massachusetts with its magnificent network of modern asphalt-paved roads only confused, rather than converted, the people of Connecticut. When Highway Commissioner Newman E. Argraves announced his decision to pave 69 miles of the turnpike with asphalt he was immediately made the target of a bond-holder's suit. But the courts upheld him in his right to make an engineering decision, and Commissioner Argraves stood fast.

The result has been another triumph of engineering and asphalt technology. On a foundation of 24 inches of compacted soil and a subbase of from 11 to 23 inches of compacted gravel, the 10½ inches of pavement proper were built. This consists of 4 inches of dry-bound macadam with sand filler and 3 inches of asphalt penetration macadam using a ½ inch choke stone, all topped with 3½ inches of asphaltic concrete pavement laid in two courses.

The 2 inches of binder course offered no problem and was laid rapidly. The 1½ inches of wearing course, however, called for an exceedingly dense mixture using a ⅜ inch maximum size stone of extreme hardness. This meant using trap rock, with great care being taken to produce a mix within the narrow specification limit.

ASPHALT CURB ALL THE WAY

A special feature of the Turnpike is the use of asphalt lip curbing on the full length of the road, the first major highway to adopt this feature. In addition, asphalt-paved shoulders were specified for the full 129 miles, ten feet wide on the outside and three feet wide at the median strip. The shoulder construction alone required 1,971,000 square yards of asphalt paving material—nearly a quarter of a million square yards more than was involved in the actual paving of the driving surfaces. More than 3.8 million square yards of asphalt paving are represented on the whole turnpike project.

Two types of shoulder construction were used. In some instances 3 inches of penetration on a stone base was covered with light screenings. In other cases, a 3½-inch asphaltic concrete binder and wearing course was placed on 4 inches of gravel base, giving the same appearance as the paved lanes.

COST HIKED TWICE

Cost of this magnificent addition to the nation's turnpike system has climbed from the first estimate of $398 million in 1953 to $445 million in 1956, and now to $464 million. But there is little fear that the bonded debt will not be amortized easily out of toll revenues and concessions, although the schedule of tolls already has been revised upwards from 15 cents to 25 cents (gate-to-gate) for passenger cars. There are eight toll stations on the 'pike. Ever since the first Pilgrim picked his way south from the Massachusetts Bay Colony to Nieuw Amsterdam over rock and rill there has never been any dearth of travelers over this route, nor any noticeable reluctance to pay a reasonable toll which would expedite the journey.

Based on past history, Connecticut's multi-million dollar effort to hasten the pilgrim's progress should soon challenge the 5-year-old New Jersey Turnpike for the title of nation's busiest toll road.

Asphalt lip-curb all the way. Inset shows close-up of curbing.

D. HUGH JENKS

Chairman of the Board
and of the Executive Committee
The Asphalt Institute

Moving into the position of Chairman of The Asphalt Institute's Board of Directors and Executive Committee for 1958 is D. Hugh Jenks, General Manager of the Asphalt Department, Ashland Oil & Refining Company, Ashland, Kentucky. A native of Raleigh, North Carolina, Mr. Jenks was graduated from Staunton Military Academy and the University of Cincinnati. He joined Ashland Oil & Refining Company as laboratory analyst at the Catlettsburg refinery, later becoming Chief Chemist. Moving over to the sales department, Mr. Jenks steadily advanced to Sales Manager of the Asphalt Department, then to General Manager of the department with supervision over asphalt departments at Ashland, Buffalo, Findlay, Ohio, and Pittsburgh.

Coming: A Year of Decision

by D. Hugh Jenks

Contrary to expectations, last year was not one of great decision in the paving field. Highway officials generally were preoccupied with other problems attendant upon the launching of a massive national road-building effort. Here and there, the faint suspicion of a trend asserted itself. But major policy decisions were held in abeyance, or advanced nervously and uncertainly.

In 1958 the road program will be settling into stride. Patterns and policies which are now only dimly defined will become fixed and inflexible. Paving policy will tend to crystallize as more important projects on the Interstate System reach the paving stage.

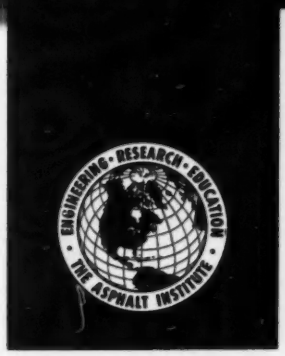
This will almost certainly be the year of decision we expected in 1957. The extra year of grace has been a fruitful one. We have seen the Commissioner of Public Roads, in a policy statement, assert that "the continued use of competitive construction types, construction materials, construction equipment, and construction bidding will result in the most economic accomplishment of the long-range highway program and utilize the highway dollars provided in the best public interest."

During the last several months the states have been quietly making a reappraisal of their dollar needs to complete the road program. It is no secret that the price tag on the program has skyrocketed as a result of this second look. In the weeks and months ahead, more and more state officials will give thoughtful consideration to Commissioner Curtiss' sobering call for economy. That means more and more highway officials will be inclined to turn an attentive ear to the case for dollar-saving asphalt paving.

The year of decision will also be a year of agonizing reappraisal. It should be a good year for Economy to speak with a commanding voice.

EXECUTIVE COMMITTEE, THE ASPHALT INSTITUTE

These representatives of member companies assumed the helm of The Asphalt Institute at the December directors' meeting in New York. Front row, l. to r.—Edward J. Barnes, Macmillan Petroleum Corp., Los Angeles, Calif.; L. P. Street, American Bitumuls & Asphalt Co., Baltimore, Md.; Chairman of the Board D. Hugh Jenks, Ashland Oil & Refining Co., Ashland, Ky.; Joseph W. Lackey, Malco Refineries Inc., Roswell, N. M.; Phil C. Doyle, Standard Oil Co. (Ohio), Cleveland, O.; and Frank E. Widger, The Texas Co., Chicago. Back row, l. to r.—Immediate Past Chairman of the Board Robert O. Wilson, Cosden Petroleum Corp., Arlington, Tex.; Alex G. Finney Jr., Houston, Tex.; James S. Van Pelt, Barry Refining Co., Chicago; J. J. Tumpeer, Treasurer, Pioneer Products Division, Witco Chemical Co., N. Y.; Richard B. Lewis, Shell Oil Co., N. Y.; Howard D. Webb, Envoy Petroleum Corp., Long Beach, Calif.; and Eugene M. Stone, Empire Petroleum Co., Denver.



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